NAME: CLASS PERIOD: DATE:

Investigation

GREENHOUSE EFFECT

Background Information

Radiant energy from the sun passes easily through earth's atmosphere. At the surface, the energy is absorbed and changed into heat by water, soil, and other materials. These materials then re-radiate infrared energy (heat) back out towards space. But not all the heat escapes. Some of it is trapped by carbon dioxide (CO_2) and other so-called "greenhouse gases" in the atmosphere, thus warming the earth.

In this investigation you will explore the greenhouse effect and explain its effect on our atmosphere.

Problem *(fill in problem):* _____

_____

Hypothesis

If an energy source is supplied to an enclosed space, then:

_____

Materials

2 cardboard shoe boxes
triple beam balance
2 thermometers with metal backs
weighing paper (coffee filter)
infrared lamp (heat lamp)
dark soil
ring stand
lamp clamp
ruler or meter stick
2 small plastic trash bags

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GREENHOUSE EFFECT INVESTIGATION CONT.

Procedure

1. Cut a slit in the side of one of the shoe boxes about halfway up. Make the slit just big enough to allow the thermometer to fit snugly. Use tape if necessary to secure the thermometer to the box.

2. Using the balance beam and weighing paper, obtain a 50g sample of soil.

3. Place the soil in the box.

4. Repeat steps 1-3 for the second box, making sure you cut the second slit the same distance from the bottom of the box.

5. Cover one of the boxes with plastic wrap and secure to the box with tape.

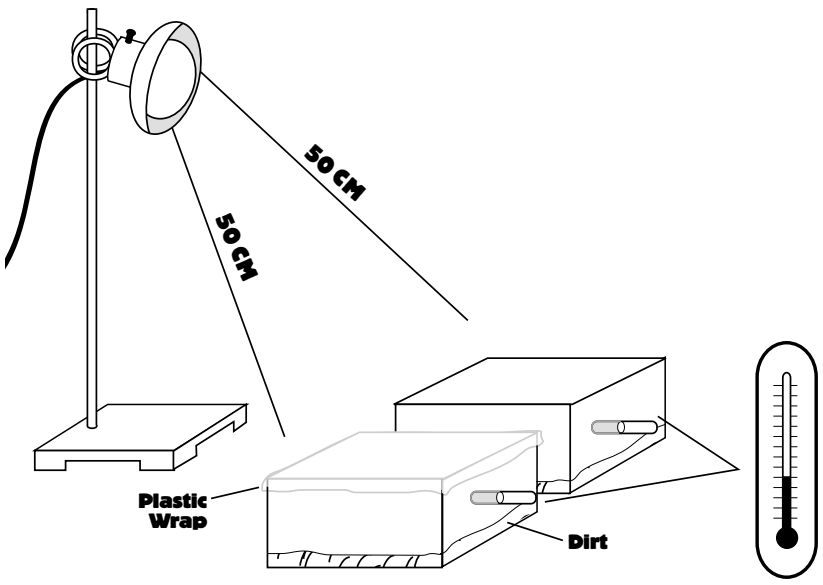
6. Place the heat lamp with clamp on the ring stand.

7. Place each box 50 cm from the light.

8. Before turning on the light, record the starting temperature in each box in the data table found on the next page. Turn on the light and record the temperature every minute for 10 minutes.

9. `Turn off the light but continue to record the temperature in each box every minute for six more minutes.

10. Using the data collected, graph the results. Don't forget to label the graph and use the proper units of measurement.



GREENHOUSE EFFECT INVESTIGATION CONT.

Observations

TIME (min.)	TEMPERATURE IN CLOSED BOX (^{0}C)	TEMPERATURE IN OPEN BOX (^{0}C)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

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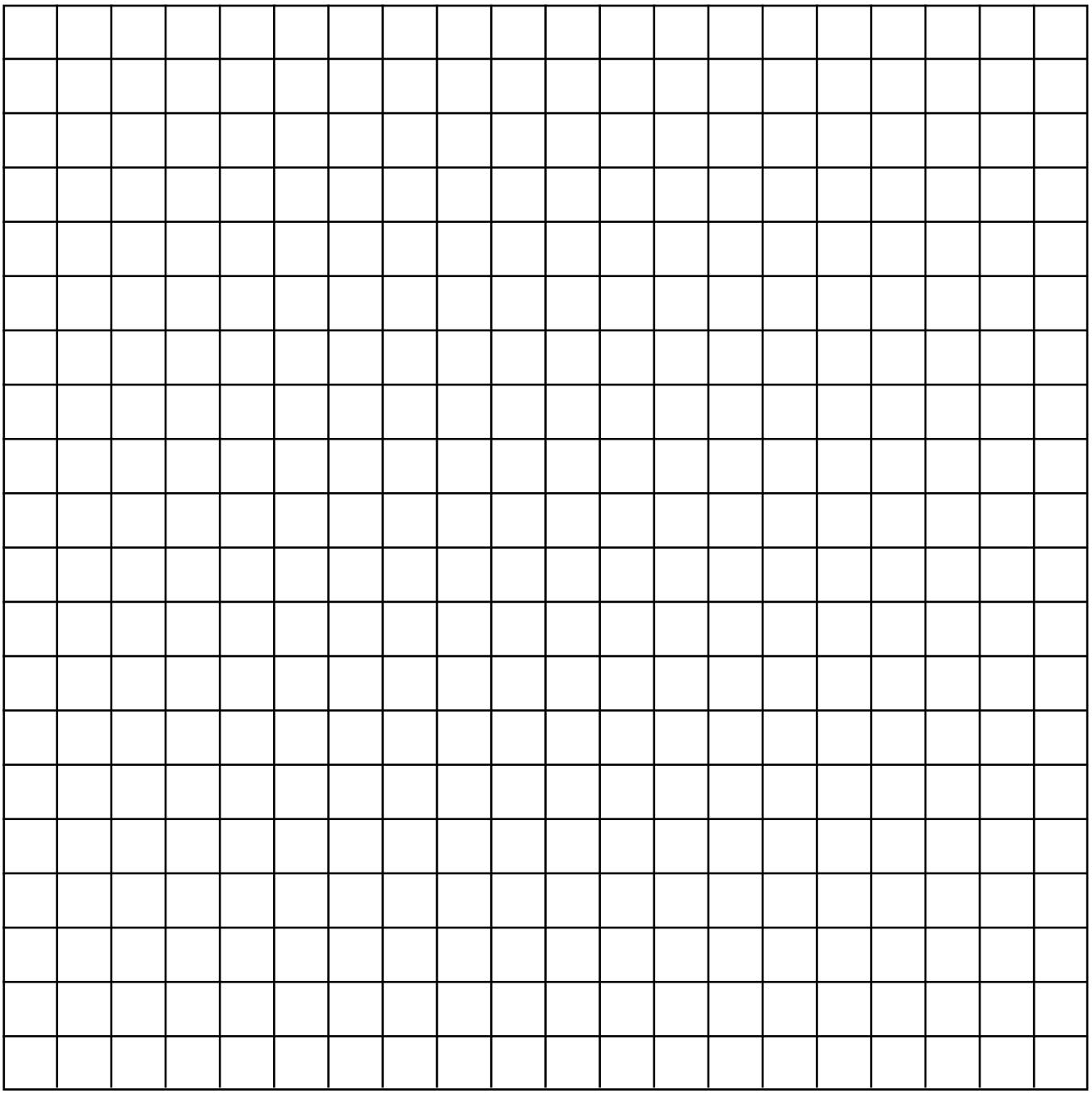
GREENHOUSE EFFECT INVESTIGATION CONT.



GREENHOUSE EFFECT INVESTIGATION CONT.

Analysis and Conclusion

1. Which of the boxes had the greater increase in temperature?_____

   Why? _____

2. Which of the boxes cooled off faster? _____

   Why? _____

Application

1. How does your model represent the greenhouse effect? _____

   _____

2. Explain why greenhouse gases cause the earth to warm up. _____

   _____

3. What was the significance of recording the temperatures of the boxes after the light was turned off? _____

   _____

4. Explain why the carbon cycle does not contribute to the greenhouse effect.

   _____

5. What would you predict would happen if pollution continued to increase? _____

   _____

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GREENHOUSE EFFECT INVESTIGATION CONT.

6. A model can be defined as a simplified description or conception of a system, used to understand the system. The model created in this investigation has been oversimplified. What could be done to improve the model? (Hint: what type of light was used?)

_____

_____

Extension

1. Predict what would happen if you repeated the experiment, first lining the shoe box with a plastic bag and adding 1/2 cup of water to the soil. _____

_____

_____

2. What role would the water play in the new model?_____

_____

3. What would happen to the amount of water vapor in the atmosphere if pollution increased from present levels? _____

_____

Extra Credit

Allow students to perform the hypothesized experiment.